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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/057,455
Filing Date: April 09, 1998
Appellant(s): HAMADA, TAKEHIKO

Thomas W. Perkins
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed October 7, 2003 and a supplemental Appeal Conference on August 24, 2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

This appeal involves claims 1-20; however, upon a review of the Appeal Brief filed on October 7, 2003, Claim 20 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art does not disclose a position detecting system that irradiates a circuit component with a primary electron beam and measures an electric current flowing through the silicon substrate of the circuit component to detect the positions of both a contact hole through an insulating film on the substrate and a gate electrode on a gate oxide film also located on the substrate.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is substantially correct. The changes are as follows:

Since claims 1-14 have not been canceled, only "withdrawn from this appeal", they are still present in the application and the issues are whether claims 6 and 12 are indefinite under 35 U.S.C. §112, second paragraph, for including contradictory limitations;

whether claims 1-4 and 7-10 are unpatentable under 35 U.S.C. §103(a) as being obvious over Munakata in view of Kato et al. and Ichihashi et al.;

whether claims 5 and 11 are unpatentable under 35 U.S.C. §103(a) as being obvious over Munakata, Kato et al., Ichihashi et al., and Todokoro et al.;

whether claim 15 is anticipated under 35 U.S.C. §102(b) by Peckerar et al.;

whether claims 13, 14, and 16-18 are unpatentable under 35 U.S.C. §103(a) as being obvious over Munakata, Kato et al., Ichihashi et al., and Peckerar et al.; and

whether claim 19 is unpatentable under 35 U.S.C. §103(a) as being obvious over Peckerar et al., Munakata, Kato et al., Ichihashi et al., and Todokoro et al.

(7) Grouping of Claims

The rejection of claims 1-4 and 7-10 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

The rejection of claims 5 and 11 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

The rejection of claims 13-19 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

Claim 1-14 contain(s) substantial errors as presented in the Appendix to the brief. Accordingly, claims 1-14 are correctly written in the Appendix to the Examiner's Answer.

(9) Prior Art of Record

3,535,516	MUNAKATA	10-1970
4,039,829	KATO et al.	8-1977
4,219,731	MIGITAKA et al.	8-1980
4,581,534	TODOKORO et al.	4-1986
4,600,839	ICHIHASHI et al.	7-1986
5,703,373	PECKERAR et al.	12-1997

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 6 and 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. These claims all contain limitations that

contradict limitations in the claims from which they depend. Claims 6 and 12 claim that either secondary or reflected electrons are detected and that the positions of the electron beam at the start of the scan and at the time the amount of these detected electrons change are used to measure the size of the portion to be measured, a process which inherently involves detecting the position of this portion; however, these claims depend from claims 1 and 7, respectively, which claim that the detection of secondary or reflected electrons are not involved in detecting the position of the portion to be measured. This is a contradiction.

Claims 1-4 and 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Munakata in view of Kato et al. and Ichihashi et al. Munakata discloses a method and apparatus for generating an image of a specimen comprising a voltage applying means 15 which applies a voltage to a sample 6 while an electron beam 16 is scanned across the sample and the resultant current induced in the sample by the electron beam is detected and correlated with the position of the electron beam to generate an image of the sample. Kato et al. teaches that such apparatus can be used to measure distances between points on the sample. One of the measurement methods taught by Kato et al., as summarized at lines 26-30 in column 2, involves determining the position of a mark on the sample image by measuring the delay between a beam scanning start time and the time at which the scanning electron beam reaches the position represented by the mark. According to Kato et al., the size of any given feature on the specimen can be measured by making a mark on opposing edges of the feature and measuring the distance between the two marks. Ichihashi et al. teaches that instead of the operator arbitrarily choosing two marks to indicate a distance to be measured, means can be provided to select the

opposing edges by detecting the changes in the signals generated by the interaction of the electron beam and the specimen. While both Kato et al. and Ichihashi et al. illustrate embodiments of their inventions wherein either secondary or reflected electrons are detected, both patents state (Kato et al. at lines 11-20 in column 1 and Ichihashi et al. at lines 5-8 in column 3) that any signal generated by the interaction of the electron beam and the specimen can be used. Munakata teaches at lines 27-32 in column 1, that specimen currents are known in the art to be equivalent to back-scattered or secondary electrons for purposes of detection in scanning electron microscopes to indicate the interaction of an electron beam with a specimen. Munakata et al. also teaches, at lines 19-26 in column 5, that it is not necessary to detect secondary or reflected electrons while an electric current induced in the specimen as it is scanned with the electron beam is detected. It would therefore have been obvious to a person having ordinary skill in the art to use Kato et al.'s measuring system to measure distances between points observed using the Munakata scanning electron microscope with changes in the detected signals being used to indicate the points to be measured, in the manner taught by Ichihashi et al.

Claims 5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Munakata, Kato et al., and Ichihashi et al. as applied to claims 1-4 and 7-10 above, and further in view of Todokoro et al. Todokoro et al. teaches at lines 56 in column 1 through 14 in column 2 that the presence of passivation layers on integrated circuits creates a capacitance that prevents the observation of DC voltages in the integrated circuits by scanning electron microscopes. According to Todokoro et al., the way to overcome this problem is to periodically vary the bias voltage applied to the integrated circuit sample. It would therefore have been obvious to a person having ordinary skill in the art to

periodically vary the bias voltage applied to the sample in the Munakata/Kato et al./Ichihashi et al. method and apparatus discussed above in order to overcome the capacitance problem disclosed by Todokoro et al.

Claim 15 is rejected under 35 U.S.C. 102(b) as being anticipated by Peckerar et al. As is explained at lines 22-34 in column 4, line 14 in column 7 through line 11 in column 8, and illustrated by EXAMPLE 1 at lines 19-59 in column 8, Peckerar et al. discloses a position detecting system for detecting the bottom of contact holes (apertures 16) through an insulating film (electron beam absorber layer 12) on a silicon substrate (illustrated in Figure 6) by scanning an electron beam across the surface of the substrate while applying a voltage to the rear surface of the substrate (as is also illustrated in Figure 6) so that a current is detected through the substrate only when the electron beam strikes one of the apertures in the insulating film.

Claims 13, 14, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Munakata, Kato et al., and Ichihashi et al. as applied to claims 1-4 and 7-10 above, and further in view of Peckerar et al. Munakata does not describe in detail how the bias voltage is applied to the specimen or where the current detecting means detects the current in the specimen, it would therefore have been obvious to a person having ordinary skill in the art locate the means for performing both these functions on the bottom of the sample in the manner taught by Peckerar et al. As was explained in the previous office action, Kato et al. teaches that scanning electron beam systems, such as that disclosed by Peckerar et al., can be used to measure distances between points on the sample. One of the measurement methods taught by Kato et al., as summarized at lines 26-30 in column 2, involves determining the position of a mark on the sample image by

measuring the delay between a beam scanning start time and the time at which the scanning electron beam reaches the position represented by the mark. According to Kato et al., the size of any given feature on the specimen can be measured by making a mark on opposing edges of the feature and measuring the distance between the two marks. Ichihashi et al. teaches that instead of the operator arbitrarily choosing two marks to indicate a distance to be measured, means can be provided to select the opposing edges by detecting the changes in the signals generated by the interaction of the electron beam and the specimen. While both Kato et al. and Ichihashi et al. illustrate embodiments of their inventions wherein either secondary or reflected electrons are detected, both patents state (Kato et al. at lines 11-20 in column 1 and Ichihashi et al. at lines 5-8 in column 3) that any signal generated by the interaction of the electron beam and the specimen can be used. Munakata teaches at lines 27-32 in column 1, that specimen currents are known in the art to be equivalent to back-scattered or secondary electrons for purposes of detection in scanning electron microscopes to indicate the interaction of an electron beam with a specimen. It would therefore have been obvious to a person having ordinary skill in the art to use Kato et al.'s measuring system to measure distances between points observed using the Peckerar et al. scanning electron microscope with changes in the detected signals being used to indicate the points to be measured, in the manner taught by Ichihashi et al.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Peckerar et al., Munakata, Kato et al., and Ichihashi et al. as applied to claims 13, 14, and 16-18 above, and further in view of Todokoro et al. As is explained above, Todokoro et al. teaches at lines 56 in column 1 through 14 in column 2 that the presence of passivation

layers on integrated circuits creates a capacitance that prevents the observation of DC voltages in the integrated circuits by scanning electron microscopes. According to Todokoro et al., the way to overcome this problem is to periodically vary the bias voltage applied to the integrated circuit sample. It would therefore have been obvious to a person having ordinary skill in the art to periodically vary the bias voltage applied to the sample in the Peckerar et al./Munakata/Kato et al./Ichihashi et al. method and apparatus discussed above in order to overcome the capacitance problem disclosed by Todokoro et al.

(11) Response to Argument

Appellant does not argue with the rejection of claims 1-14, so these rejections should stand.

Appellant argues that Peckerar et al. does not disclose the "position detecting means" claimed in claim 15. Instead, according to appellant:

> "Peckerar et al. already know the position of the apertures in the fiducial pattern and [are] only concerned with the position of the electron beam relative to the film on which the beam makes a useful image since they want to be sure that the beam is in the correct position on the film when making the image."

However, it must be noted that Peckerar et al. finds the "position of the electron beam relative to the film" by finding the position of the electron beam relative to fiducial electron beam detectors that are at known positions on the workpiece on which the film is deposited. Since Peckerar et al.'s fiducial electron beam detectors inherently comprise the bottoms of holes 16 through an insulating film 12, appellant's argument is basically that

the claimed function of "detecting the position of the bottom of said contact hole, with reference to the scanning start position of said electron beam and the position when the detected current changes," is different from Peckerar et al.'s function of detecting the position of a scanning electron beam with respect to the position of the bottom of a hole through an insulating film. This argument is unconvincing because knowledge of the position of object A (the electron beam) relative to object B (the hole) inherently also indicates the position of object B relative to object A. This is implicitly recognized by Peckerar et al. at lines 5-8 in column 8 of the patent which discuss a modification of the means for detecting current flow through the workpiece as the electron beam scans across it "to improve the ability to locate the leading and/or trailing edges of the apertures 16."

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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jb
August 24, 2004

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